

Amendments to the Drawings

The attached sheet of drawings includes changes to Figure 1A and 1B. This sheet which includes Figures 1A and 1B, replaces the original sheet including Figure 1A and 1B. In Figures 1A and 1B, the designation as “Prior Art” has been added

Attachment: One Replacement Drawing Sheet.

REMARKS

The drawings have been objected to. The specification has been objected to. Claim 6 was rejected under 35 U.S.C. §102(b) as being anticipated by Bresnick (U.S. 3,804,710). Claims 7 and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Clapham (U.S. 4,046,631). Claim 9 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Ocken (U.S. 4,120,752). Claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Hayashi et al. (U.S. 4,111,748).

Claim 6 has been amended.

Claims 11 to 13 have been added.

Reconsideration of the application based on the following remarks is respectfully requested.

Drawing Objections

The drawings Figure 1A and 1B were objected to for not being designated as prior art.

Figures 1A and 1B have been amended to include this distinction. Applicants thank the Examiner for pointing this out and respectfully request withdrawal of the objection.

Specification Objections

The disclosure is objected to because of informalities.

The specification has been amended to address the informalities pointed out by the Examiner.

Withdrawal of the objections is respectfully requested.

35 U.S.C. §102 Rejections

Claim 6 was rejected under 35 U.S.C. §102(b) as being anticipated by Bresnick (U.S. 3,804,710).

Bresnick discloses a nuclear reactor fuel element comprising “a tubular cladding member or tube 1, of the desired diameter and length. Within this tube are placed fuel pellets 2 which fill the tube from the bottom end up to a distance from the top end sufficient to

provide a fission gas receiving chamber 3 of the required dimension.” (Col. 2, lines 17 to 22).

Claim 6 has been amended to recite in part, “a volume of the annular space being a function of expansion of gas in the fuel rod during operation.” Support found in the specification on page 11, lines 5 to 9, for example.

Bresnick fails to teach or show “a volume of the annular space being a function of expansion of gas in the fuel rod during operation,” as recited in claim 6. In Bresnick, the head member 14 supports the lowest fuel pellets 2 a “sufficient distance from the weld 20.” This distance is “to prevent temperature gradients or fuel pellet swelling during reactor service from producing unacceptable high stresses such as could cause rupture of the weld, or of the cladding near the weld.” (Col. 3, lines 14 to 20).

As noted throughout the present specification, the volume of the annular space of the present invention is to provide adequate space for the expansion of gas during operation. Bresnick’s volume is much smaller and not “a function of expansion of gas of the fuel rod during operation.”

Withdrawal of the rejections of claim 6 under 35 U.S.C. §102(b) is respectfully requested.

35 U.S.C. §103 Rejections

Claims 7 and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Clapham (U.S. 4,046,631).

Bresnick is discussed above.

Clapham discloses a “metal nuclear fuel can provided with a metal closure plug for closing and open end of the can, the plug having a closure portion dimensioned to engage the open end, a stem of reduced cross-sectional area extending axially from the dimensioned portion into the can interior, the stem terminating in a flange of enlarged cross-section formed of a material which is selectively susceptible of attack by hydrogen.” (Col. 1, lines 46 to 54).

In light of the discussion above, withdrawal of the rejections of claims 7 and 8 is respectfully requested.

With further regard to claim 7, claim 7 recites, “wherein the third cylindrical portion of the inner portion of the lower plug of the fuel rod has a diameter such that there remains, between the outer lateral surface of the third cylindrical portion and the inner surface of the tubular cladding, a radial clearance for assembly and passage of gas of between one and two tenths of a millimeter.”

Both Bresnick and Clapham fail to teach or show “a radial clearance for assembly and passage of gas of between one and two tenths of a millimeter,” as recited in claim 7. It would not have been obvious to modify Bresnick in view of Clapham, nor would routine experimentation by one of skill in the art have come up with the limitation set in claim 7, as one of skill in the art would not have determined that the clearance size would be a result effective variable.

With further regard to claim 8, claim 8 recites “wherein the second cylindrical portion of the inner portion of the lower plug has a diameter of between 40% and 60% of the inner diameter of the tubular cladding and a length in the axial direction of between 8 and 10 times the inner diameter of the tubular cladding.”

Both Bresnick and Clapham fail to teach or show “the second cylindrical portion of the inner portion of the lower plug has a diameter of between 40% and 60% of the inner diameter of the tubular cladding,” as recited in claim 8. It would not have been obvious to one of skill in the art to modify Bresnick in view of Clapham, nor would routine experimentation by one of skill in the art have come up with the limitation set in claim 8. One of skill in the art would not have determined that the proportions of the lower plug diameter and inner diameter of the cladding would be a result effective variable. Furthermore, the length “of between 8 and 10 times the inner diameter of the tubular cladding,” is not mere design but a important feature of the invention. This defines the air space of the annular space.

Withdrawal of the rejection of claims 7 and 8 for these reasons as well is respectfully requested.

Claim 9 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3, 804, 710), as applied to claim 6, in view of Ocken (U.S. 4,120,752).

Bresnick is discussed above.

Ocken discloses a fuel pellet comprised of an inner cylindrical part provided with a mixture of uranium oxide and plutonium oxide, and an outer annular part integral with the inner part and containing uranium oxide free of plutonium oxide.” (See Abstract).

In light of the discussion above regarding independent claim 6, withdrawal of the rejection is respectfully requested.

Furthermore, in regard to claim 9, claim 9 recites “wherein at least a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium.”

Bresnick fails to teach or show use of “a portion of the fuel pellets of the column of fuel pellets comprises one of plutonium oxide and a mixed oxide of uranium and plutonium,” as recited in claim 9. It would not have been obvious to one of skill in the art to modify Bresnick in view of Ocken as Bresnick is not designed to have expansion space or gas capabilities for use with MOX.

Withdrawal of the rejection of claim 9 for these reasons as well is respectfully requested.

Claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bresnick (U.S. 3,804,710), as applied to claim 6, in view of Hayashi et al. (U.S. 4,111,748).

Bresnick is discussed above.

Hayashi et al. discloses

In light of the discussion above regarding independent claim 6, withdrawal of the rejection is respectfully requested.

Furthermore, in regard to claim 10, claim 10 recites “at least one cross-member in at least one zone of the second cylindrical portion, extending in an axial direction, the at least one cross-member constituted by a diametrically widened cylindrical portion of the second cylindrical portion that has an outer diameter that is substantially equal to the inner diameter of the tubular cladding that is reduced by an assembly clearance.”

Both Bresnick and Hayashi fail to teach or show “at least one cross-member in at least one zone of the second cylindrical portion, extending in an axial direction, the at least one cross-member constituted by a diametrically widened cylindrical portion of the second cylindrical portion that has an outer diameter that is substantially equal to the inner diameter of the tubular cladding that is reduced by an assembly clearance,” as recited in claim 10. The Office Action asserts cylindrical body 6e is the cross member. However, Hayashi discloses a support for the fuel pellets in the fuel rod, which is similar to the third portion in the present invention. The purpose of cross member 17 is to allow gas to pass through, prevent scorching of the cladding and guides the central part of the plug inside the cladding. (Specification page 11, lines 28 to 31). It would not have been obvious to one of skill in the art to modify Bresnick in view of Hayashi. Furthermore there is no motivation to do so.

Withdrawal of the rejection of claim 10 for these reasons as well is respectfully requested.

New Claims

Claims 11 to 13 have been added. Support for claim 11 can be found in previously presented claims 6 and 9, for example. Support for claim 12 can be found in the Substitute Specification on page 11, lines 5 to 9, for example. Support for claim 13 can be found in the Substitute Specification on page 10, lines 31 to 32, for example

It is respectfully submitted that these claims are patentable.

CONCLUSION

It is respectfully submitted that the application is in condition for allowance and applicants respectfully request such action.

If any additional fees are deemed to be due at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

Respectfully submitted,

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